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Experiments with Emulsions for protecting Camels against the attacks of Blood-sucking Flies

BY

H. E. CROSS, M.R.C.V.S., D.V.H., A.Sc.,
Camel Specialist, Punjab.

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Experiments with Emulsions for protecting Camels against the attacks of Blood-sucking Flies.

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IT is a well known fact that surra is spread from camel to camel by blood-sucking flies. If healthy camels have to pass through an area where surra is known to exist and blood-sucking flies are prevalent the chances of healthy camels marching through the area without contracting the disease are very remote. If, however, the healthy camels can be protected against the attacks of blood-sucking flies they would be able to march through the area without fear of contracting the disease. The following experiments were carried out to determine the efficacy of various preparations for protecting camels against blood-sucking flies.

The following emulsions were used :—

I. Kerosine oil emulsion.
II. Tara-mira (*Eruca sativa*) oil emulsion.
III. An emulsion prepared by Mr. Warde of the Forest Department.
IV. Asafœtida solution.
V. Chirpine oil emulsion.
VI. Creosol emulsion.
VII. Jensen's emulsion.
VIII. Citronella oil.
IX. Aniseed oil.
X. Cod liver oil.
XI. Castor oil.

I. Kerosine oil emulsion.

Six camels were used in the experiments, four being sprayed with the emulsion and two acting as controls. One control was kept 50 yards away from the other camels and the other control was kept in the centre of the sprayed camels, each of these being tied about five yards distant from one another, all close to a permanent pond in a grazing ground in the plains, where Tabanidæ were found to be prevalent.

The emulsion was made by dissolving soap in water, slowly adding the kerosine oil, stirring briskly the whole time. It was applied to the camel by means of a spray pump.

Experiment 1.

Soap	1 lb.
Kerosine oil	20 oz.
Water	1 gallon.

Each camel (except the two controls) was sprayed with two pints of the emulsion. Before the emulsion was sprayed on to the camels *Stomoxys* were numerous on all the camels. At the time of spraying the camels the *Stomoxys* at once left the camels but reappeared in 25 minutes after the application of the emulsion.

Tabanidæ appeared on the sprayed camels about 3 hours after they were sprayed. They appeared at the same time on the two control camels.

Result. Stomoxys were only kept off for 25 minutes. Tabanidæ appeared on the sprayed camels and controls at the same time ; this emulsion did not prevent Tabanidæ from biting three hours after the application.

Experiment 2.

The amount of the emulsion applied was increased by one pint, each camel being sprayed with 3 pints. The increased amount sprayed on gave no better results. *Stomoxys* appeared on the camels 25-30 minutes after the application of the emulsion. Tabanidæ appeared on the sprayed and control camels at the same time, about 3 hours after the application of the emulsion.

Result.

(1) *Stomoxys* were kept off for 25 minutes.

(2) Three hours after the application Tabanidæ were not prevented from biting.

(3) During the night mosquitos worried the camels greatly and there was no difference between the control and the sprayed camels.

II. Tara-mira (*Eruca sativa*) oil emulsion.

Experiment 1.

The emulsion consisted of—

Soap	1 lb.
Tara-mira oil	20 oz.
Water	1 gallon.

Three pints of the emulsion were sprayed on each camel. *Stomoxys* disappeared on application of the emulsion but in 25-30 minutes were again seen on the sprayed camels. Tabanidæ appeared at the same time on the sprayed and control camels about 3 hours after the application of the emulsion.

Result.

(1) *Stomoxys* were kept off 25-30 minutes.

(2) Three hours after the application Tabanidæ were not prevented from biting.

(3) The sprayed camels were worried at night by mosquitos to the same extent as the control camels.

Experiment 2.

The above experiment was repeated and the same results obtained.

III. Emulsion prepared by Mr. Warde of the Forest Department.

Experiment 1.

This anti-fly emulsion was submitted to me for trial by Mr. Warde. The preparation has a very pungent odour and would appear to contain amongst other things eucalyptus oil and turpentine. Only one pint was sent; the amount was sprayed on a camel but was insufficient to spray the camel all over thoroughly. *Stomoxys*, which were numerous on the camel before spraying commenced, on spraying the camel left at once and did not return for an hour. Its efficacy with regard to *Stomoxys* was, therefore, double that of the kerosine oil and *tara-mira* oil emulsions. Tabanidæ appeared on the controls and the camel sprayed with this preparation at the same time, namely, 3-4 hours after the application.

Result.

(1) *Stomoxys* were prevented from biting for one hour.

(2) Tabanidæ were not prevented from attacking the camel 3-4 hours after the application.

Experiment 2.

Three pints were obtained from Mr. Warde and sprayed on a camel. At a distance of four yards from the camel the odour of the preparation could be distinctly smelt. Tabanidæ were seen on the sprayed camel at the same time as on the control camels, namely, 3 hours after the application. Although it had very little effect against the flies, its effect was very marked on the camel. The camel was restless all day, and was off his feed ; next morning it was noticed that the skin was slightly blistered. I mentioned the effect of his preparation on the camel to Mr. Warde, and he stated that once when he had applied it to some of his hens for ticks they had died shortly afterwards; he had however not attributed at that time the death of his hens to the solution, but he was now convinced that the solution was the cause of death.

Result.

(1) Tabanidæ were not prevented from biting 3 hours after the application of the preparation.

(2) The skin of the camel was slightly blistered.

(3) The preparation made the camel restless and put him off his feed.

IV. Asafoetida solution.

Experiment 1.

The strength of the solution was 1 of asafœtida to 8 of water. Three pints were sprayed on each camel. *Stomoxys* were seen on the sprayed camels a few minutes after the application of the solution. Tabanidæ appeared on the sprayed camels at the same time as on the controls.

Result. The solution had no repellent action against *Stomoxys* and Tabanidæ.

V. Chirpine oil emulsion.

Experiment 1.

The emulsion consisted of—

Soap	1 lb.
Chirpine oil	20 oz.
Water	1 gallon.

Four pints of the emulsion were sprayed on each camel when *Stomoxys* were numerous on them. The *Stomoxys* at once left the sprayed camels, though they continued to be seen on the controls. Tabanidæ appeared on the control camels 2 hours before they appeared on the sprayed camels.

Result. This emulsion prevented Tabanidæ from attacking the camel for two hours.

Experiment 2.

Experiment 1 was repeated in the hills (altitude 6,000 ft.) on some camels that were placed in a thick jungle in which Tabanidæ were very numerous. The trees afforded a great deal of protection from the sun, consequently the emulsion did not dry nearly so quickly as it did in Experiment 1, which was carried out in the plains in a place where the trees were small and gave very little protection against the sun. In the hills the Tabanidæ appeared on the control camels 4-5 hours before they appeared on the sprayed camels.

Result.

(1) Tabanidæ were prevented from biting for 4-5 hours.

(2) The efficacy of the emulsion was greater when the camels were protected from the sun and the temperature was lower, due to the emulsion not drying so quickly.

Experiment 3.

In this experiment a stronger emulsion was used and consisted of—

Chirpine oil	40 oz.
Soap	1 lb.
Water	1 gallon.

Four pints of this emulsion were sprayed on the camels.

Result.

(1) Tabanidæ appeared on the control camels three hours before they appeared on the sprayed camels.

(2) With this strength of emulsion there is a tendency to blister when the camels are not protected from the sun.

VI. Creosol emulsion.

This emulsion was suggested by Major Rudd, A.V.C., and was composed of—

Creosol	1 oz.
Pix Liquida	2 oz.
Soft Soap	8 oz.
Water	3 pints.

The amount Major Rudd recommends to be used is 3 pints.

Experiment 1.

Six camels were sprayed with 3 pints of the emulsion at 5 P.M. These camels were placed in the shade of trees near water, one unsprayed camel to act as control, being placed in close proximity to them. They were kept under observation for two hours. Two Tabanidæ were caught on the control (unsprayed) camels but none were found on the sprayed camels. The fact that only two Tabanidæ were seen on the unsprayed camel, showed that only few Tabanidæ were about at the time; on the other hand it should be noted that the only Tabanidæ seen in two hours were on the unsprayed camel, none being found on the sprayed.

Experiment 2.

The six sprayed camels and the one unsprayed camel were examined next morning between 6 A.M. and 7 A.M. (*i.e.*, about 13 hours after being sprayed) for Tabanidæ. A large number of Tabanidæ were found on the sprayed and also on the control (unsprayed) camel. Tabanidæ attacked the sprayed and unsprayed equally.

Experiment 3.

The six camels were again sprayed at 7·30 A.M. and were placed in the sun in close proximity to the unsprayed camel and though Tabanidæ flew round the sprayed camels they did not settle and suck blood till thirty minutes had elapsed after the application of the emulsion.

Result.

(1) Three pints of this emulsion are scarcely sufficient to spray a camel thoroughly.

(2) After 12-13 hours the emulsion did not prevent the Tabanidæ from biting.

(3) If the camels were sprayed and kept in the sun the emulsion prevented Tabanidæ from biting for ½ hour only.

(4) As soon as the emulsion has dried on the skin it does not appear to have the slightest efficacy against the attacks of Tabanidæ.

VII. Jensen's emulsion.

This emulsion is composed of—

Kerosine oil	1 gallon.
Powdered naphthaline . . .	4 oz.
Soap	1 lb.
Water	4 gallons.

Experiment 1.

One application of this emulsion is said to protect cows against *Stomoxys calcitrans* and *Lyperosia irritans* for a week. Five pints of this solution were sprayed on two camels at 7 A.M. and one unsprayed camel acted as control. The three camels were tied at a short distance from one another, near a pond in a *rakh* (grove), where Tabanidæ were known to be prevalent. Between 4 P.M. and 7 P.M. Tabanidæ and *Stomoxys* were observed on the control but none were seen on the sprayed camels. At 8 A.M. on the following day one Tabanus was observed on one of the sprayed camels. Between 4 P.M. and 7 P.M. numerous Tabanidæ were present on both the sprayed and unsprayed camels.

Remarks.

(1) At the time when these experiments were carried out, camels had little or no hair and the sun was very powerful.

(2) The emulsion caused severe blistering of the skin.

Result.

(1) This emulsion prevents Tabanidæ from biting for 12 hours.

(2) The emulsion cannot be recommended for camels as it causes severe blistering of the skin.

VIII. Citronella oil.

Experiment 1.

Three camels were used in this experiment, one being sprayed with 3 pints of the oil and the remaining two acting as controls. At 5-30 P.M.

when Tabanidæ and *Stomoxys* were observed on all three camels three pints of the oil were sprayed on one camel. From 5-30 P.M. to 7-30 P.M. no Tabanidæ or *Stomoxys* were seen on the sprayed camel but they continued to bite the two unsprayed. After 7-30 P.M. no flies were observed on the controls. On the following day Tabanidæ appeared on the sprayed and unsprayed at about the same time (12 noon).

Result.

(1) Citronella oil prevents Tabanidæ and *Stomoxys* from biting for a few hours.

(2) It has no repellent action after 17 hours.

IX. Cod liver oil.

Experiment 1.

Three camels were used in this experiment, one being smeared with oil and two being left unsmeared to act as controls. The three camels were tied at a short distance from one another and 17 oz. of oil was smeared on one camel by means of a rag. A few minutes after the application of the oil *Stomoxys* were seen on the camel, the oil had no repellent action whatever against *Stomoxys*.

Three hours after the application of the oil Tabanidæ were observed on the smeared and unsmeared camels.

Result. Cod liver oil has no repellent action against Tabanidæ and *Stomoxys*.

X. Aniseed oil.

Experiment 1.

Three camels were used, one being sprayed with one pint of oil, the remaining two acting as controls. After the application of the oil, the camel became restless but after about one hour the irritating effect of the oil passed off. Two and a half hours after the application of the oil Tabanidæ were seen to suck blood; Tabanidæ were noticed about the same time on the controls. *Stomoxys* were observed on the controls practically the whole time but were only observed to settle on the sprayed camel 3 hours after the application of the oil.

Result.

(1) Aniseed oil has no repellent action against Tabanidæ 2½ hours after application.

(2) It has a slight repellent action against *Stomoxys.*

(3) The application of only one pint causes great restlessness in the camel.

XI. Castor oil.

Experiment 1.

One pint of castor oil was smeared on one camel, 3 unsmeared camels acting as controls.

Thirty-five minutes after the application of the oil Tabanidæ were seen on the controls. Fifty minutes after the application of the oil Tabanidæ approached the smeared camel but did not settle.

One hour and fifteen minutes after the application of the oil Tabanidæ were seen sucking blood on the smeared camel. *Stomoxys* were observed on the smeared camel twenty minutes after the application of the oil.

Result. One pint of castor oil smeared on a camel has practically no repellent effect against Tabanidæ and *Stomoxys.*

Experiment 2.

One camel was smeared with 3 pints of castor oil and five unsmeared camels acted as controls. The oil was not applied till Tabanidæ were seen on the camels.

The oil was applied to one camel at 9-30 A.M.

From 9-30 A.M. to 10-30 A.M. no Tabanidæ were seen on the smeared camel though Tabanidæ and *Stomoxys* were numerous on the controls. During this time Tabanidæ approached the smeared camel but flew away without biting.

At 10-45 A.M. Tabanidæ were seen on the smeared camel and for the next hour Tabanidæ attacked the smeared camel to the same extent as the controls.

Result. Three pints of castor oil smeared on a camel prevents Tabanidæ from biting for only one hour.

Experiment 3.

One camel was smeared with 4 pints of oil, two unsmeared camels acting as controls. The oil was applied at 8-30 A.M.

1st day. At 9-50 A.M. *Stomoxys* appeared on the two controls and were present nearly the whole day till evening. None, however, settled on the smeared camel ; they frequently approached the smeared camel but did not settle.

At 11 A.M. Tabanidæ appeared on the controls and except from 2-30 P.M. to 4-30 P.M. were seen on the two control camels till 7 P.M. No Tabanidæ, however, attacked the smeared camel ; they frequently approached but did not settle except once when a Tabanus settled for an instant but flew away without sucking.

2nd day. *Stomoxys* were present more or less the whole day on the controls but though they approached the smeared camel they did not settle. From 11-40 A.M. to 7 P.M. Tabanidæ were frequently seen on the two controls but did not attack the smeared camel ; on three occasions Tabanidæ settled on the smeared camel for an instant but immediately flew away without sucking.

3rd day. From 8 A.M. to 6-30 P.M. *Stomoxys* were frequently seen on the two control camels. A few *Stomoxys* settled for a short time on the smeared camel, but flew away without sucking. Tabanidæ were numerous on both controls at various times during the day but none were observed on the smeared camel.

4th day. *Stomoxys* were observed on the two controls and on the smeared camel ; Tabanidæ were numerous on the controls and a few Tabanidæ were seen on the smeared camel.

5th day. *Stomoxys* and *Lyperosia* were observed on the two controls and on the smeared camel. Tabanidæ were numerous on the two controls and were also observed on the smeared camel but not nearly to the same extent as on the unsmeared camels.

6th day. *Stomoxys* were observed on the two controls and the smeared camel. Tabanidæ were also observed but were more numerous on the unsmeared than on the smeared camel.

Remarks. It was thought that castor oil might have a harmful effect upon the skin, as it is liable when exposed to the air to thicken and form a varnish-like film ; no harmful effect, however, was observed.

Result.

(1) Four pints of castor oil when smeared on a camel prevents Tabanidæ and *Stomoxys* from biting for three days.

(2) From the 4th to the 6th day Tabanidæ were less numerous on the smeared camel than on the unsmeared.

Experiment 4.

As the result obtained by smearing with 3 pints of castor oil was very different from the result obtained by smearing with 4 pints it was decided to repeat the experiment with 4 pints.

One camel was smeared with 4 pints of castor oil at 9-30 A.M. and one unsmeared camel acted as control. The camels were tied at a short distance from one another.

1st day. Stomoxys were observed on the unsmeared camel from 9-30 A.M. till evening; twenty-three Tabanidæ were counted on the unsmeared camel during the day and two Tabanidæ settled on the smeared camel but did not suck any blood. A few *Stomoxys* settled on the smeared camel but did not remain for any length of time.

2nd day. Tabanidæ were numerous on the unsmeared camel and on the smeared camel, a few Tabanidæ settled but flew away without biting. *Stomoxys* settled on the smeared camel but no *Stomoxys* were observed to bite.

3rd day. Stomoxys were observed on the control and several Tabanidæ attacked the control. On the smeared camel *Stomoxys* were numerous but none was observed to suck. Several Tabanidæ settled on the smeared camel but none was seen to suck.

4th day. Flies were not numerous; they attacked the smeared and unsmeared camels to the same extent.

Result. Four pints of castor oil prevented Tabanidæ and *Stomoxys* from biting for 3 days. *Stomoxys* and Tabanidæ were observed to settle on the smeared camel a few hours after the application of the oil; they, however, did not bite.

Remarks. The result obtained with 4 pints was very different from that obtained with 3 pints, but it is improbable that the extra pint of oil could make such a difference. At the time of year that the experiments were carried out, the quantity of hair on camels varies greatly. The camel that was smeared with 3 pints had practically no hair, whereas both camels that were smeared with 4 pints had a fair quantity of hair. The matting of the hair by the oil might explain why Tabanidæ did not attack those parts where there is hair, but it does not explain why Tabanidæ did not attack the camels smeared with 4 pints, on the sheath and inside of the thighs where there is never any hair on camels.

Conclusions.

Of the preparations used the only one that prevented Tabanidæ from attacking for any length of time was castor oil, but it cannot be recommended on account of the cost. None of the other preparations tried are of any practical value. As soon as the emulsions dry they have no repellent action against the flies.

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